TP 4 – Binary Decision Diagrams

Exercice 1

1. give the ROBDD for the formula

$$(a \wedge b \wedge c) \;\vee\; (\neg b \wedge d) \;\vee\; (\neg c \wedge d)$$

   and the order $a < b < c < d$
2. same formula but order $b < c < a < d$. Can we do better ? justify.

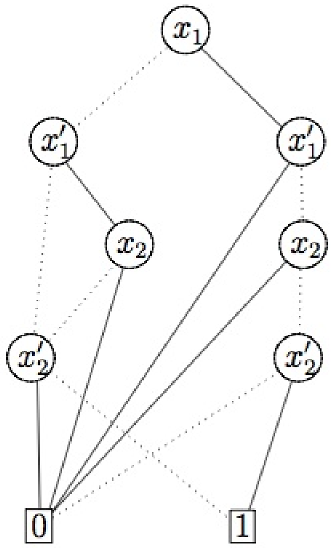
Exercice 2 Compute the ROBDD for the formula $x_1 \wedge (x_2 \vee \neg x_3)$ and the following ordering :

1. $x_1 < x_2 < x_3$
2. $x_3 < x_2 < x_1$

Exercice 3 Construct the ROBDD for

1. $f = (x_1 \wedge y_1) \vee (x_2 \wedge y_2)$ and $x_1 < y_1 < x_2 < y_2$.
2. f et $x_1 < x_2 < y_1 < y_2$. What do you observe ?
3. $g = (x_1 \wedge y_1) \vee (x_2 \wedge y_2) \vee (x_3 \wedge y_3)$ and $x_1 < x_2 < x_3 < y_1 < y_2 < y_3$ and $x_1 < y_1 < x_2 < y_2 < x_3 < y_3$.
4. $(x_1 \leftrightarrow y_1) \vee (x_2 \leftrightarrow y_2)$ with $x_1 < x_2 < y_1 < y_2$ and $x_1 < y_1 < x_2 < y_2$.
5. which order must be chosen to get the minimal RBDD for $(x_1 \wedge y_1) \vee \cdots \vee (x_k \wedge y_k)$? What is its number of nodes ?

Exercice 4 Give the Kripke structure whose transition relation is represented by the following BDD :



Exercice 5 In the following Kripke structure, give ROBDDs that represent the set of states $S_1 = \{s_0, s_1\}$ and $S_2 = \{s_1, s_2\}$.